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INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY
UNDER THE PATENT COOPERATION TREATY

Applicant:	Ztek Corporation, et al.
International Application No.:	PCT/US03/25041
International Filing Date:	08 August 2003
Priority Date Claimed:	08 August 2002
For:	SYSTEM AND METHOD FOR RECHARGING A METAL-AIR CONVERTER FOR VEHICLE PROPULSION
Authorized Officer:	John S. Maples
Attorney Docket No.:	**HSE-058PC**

MS PCT, Attn: IPEA/US
Commissioner for Patent
P.O. Box 1450
Alexandria, Virginia 22313-1450

RESPONSE TO FIRST WRITTEN OPINION

Sir:

In response to the first Written Opinion issued by the International Preliminary Examining Authority on 28 April 2004, please amend the above-referenced application as set forth in replacement pages 12-15 attached to this amendment.

Applicant amends claim 22 to recite a metal-air converter, as illustrated in FIG. 1 of the Application. Applicant also amends claim 22 to specifically recite that the metal-air converter is powered by an on-board energy source. Applicant further cancels claim 23.

The remaining claims correspond to certain originally filed claims, as set forth below in the claim concordance table. Please substitute replacement pages 12-15 of this Response for pages 12-15 of the filed patent application. Now in the application are claims 1-24.

Applicant provides the following claim concordance table to assist the Examiner in relating the new claims set forth in the replacement pages with the old claims filed with the application.

CLAIM CONCORDANCE TABLE

Original Claims	Amended Claims
1-21	1-21 (same)
22	22 (amended)
23	canceled
24	23
25	24

The foregoing amended claims introduce no new matter. Support for the amendments can be found throughout the specification and drawings, including the claims as originally filed.

REMARKS

The present invention relates to an electrically-powered vehicle that employs a motor for driving the vehicle. The electrically-powered vehicle includes *a metal-air converter powered by an on-board energy source for powering the motor.* With this arrangement, the vehicle of the present invention can travel a distance of more than three hundred miles before requiring recharging of the metal-air converter from an off-board source.

None of the art cited by the Examiner discloses or teaches a metal-air converter powered by an on-board energy source for powering the motor. The first reference, U.S. Patent No. 4,237,410 to Erickson *et al.* ("Erickson"), discloses a regenerative motor for use in a battery powered vehicle. Erickson discloses that the motor regenerates a secondary voltage to charge the battery used as a power source for powering the motor. Erickson does

not disclose a metal-air converter. Furthermore, Erickson does not disclose that the metal-air converter is powered by an on-board energy source, as recited in claim 22. In Erickson, the battery is powered by the motor itself.

The second reference, U.S. Patent No. 4,081,693 to Stone ("Stone"), also fails to teach the metal-air converter recited in claim 22. Stone teaches a vehicle propulsion system having air cell batteries and fuel cells. The Stone reference does not teach a metal-air converter. In Stone, the air cell batteries produce hydrogen and transmit the hydrogen to the fuel cells. The Stone reference does not teach that the air cell batteries are powered by the fuel cells. Accordingly, the Stone reference fails to teach that the metal-air converter is powered by an on-board energy source for powering the motor, as recited in claim 22.

CONCLUSION

The foregoing references are distinguishable from the present invention, and thus do not adversely effect the patentability thereof. None of the cited references disclose or teach a metal-air converter having the foregoing features. Accordingly, allowance of claims 22-24 are in order and respectfully requested.

Respectfully submitted,

Anthony A. Laurentano
Agent for Applicant

LAHIVE & COCKFIELD, LLP
28 State Street
Boston, MA 02109
Tel. (617) 227-7400

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Claims

1. A power supply system for powering an electric motor in an electric vehicle, the system comprising:

a generator for converting a fuel to electricity,

a metal-air converter electrically coupled to the electric motor and the generator for receiving electricity produced by the generator, and

a fuel supply for supplying fuel to the generator.

2. The power supply system of claim 1, wherein the metal-air converter comprises one of a zinc-air battery, an aluminum-air battery, a magnesium-air battery, a lithium-air battery, a calcium-air battery and an iron-air battery.

3. The power supply system of claim 1, wherein said metal-air converter is adapted to be operated:

as a rechargeable battery for receiving electricity from the generator;

as a rechargeable battery for receiving electricity from an off board electric source; and

as a fuel cell with replenished metal fuel.

4. The power supply system of claim 1, wherein the generator is selected from a group consisting of a fuel cell, a combustion engine, a gas turbine, and combinations thereof.

5. The power supply system of claim 1, wherein the generator comprises a hybrid power source including a gas turbine and a fuel cell.

6. The power supply system of claim 4, wherein said fuel cell is selected from a group including solid oxide, solid state, molten carbonate, phosphoric acid and alkaline and proton electrolyte membrane fuel cells.

7. The power supply system of claim 1, wherein the metal-air converter has an energy density greater than 200 Wh/kg or 500 Wh/l and power density greater than 200 W/kg or 500 W/l.

8. The power supply system of claim 1, wherein the generator produces power in excess of the needs for metal-air converter recharging or on board use and can offer power for off board use.

9. A method of charging a metal-air converter in an electrically-powered vehicle, comprising the steps of:

producing electricity using an on-board generator, and

applying the electricity from the generator to the metal-air converter to convert a metal oxide produced by the metal-air converter to a metal fuel.

10. The method of claim 9, wherein the metal-air converter powers an electric motor on the electrically-powered vehicle.

11. The method of claim 9, wherein the step of producing electricity comprises electrochemically converting a generator fuel to electricity.

12. The method of claim 11, further comprising the step of supplying the generator fuel to the generator.

13. The method of claim 9, further comprising the step of receiving a supply of the metal fuel from an off-board source.

14. A vehicle propulsion system for an electric vehicle, comprising:

an electric motor for driving a vehicle drive train of the electric vehicle;

a metal-air converter coupled to the motor for powering the motor; and

a generator coupled to the metal-air converter for recharging the metal-air converter and for providing power to the motor, wherein the electric motor, the metal-air converter and the generator are interconnected.

15. The vehicle propulsion system of claim 14, wherein the metal-air converter comprises one of a zinc-air battery, an aluminum-air battery, a magnesium-air battery, a lithium-air battery, a calcium-air battery and an iron-air battery.

16. The power supply system of claim 14, wherein the generator is selected from a group consisting of a fuel cell, a combustion engine, and a gas turbine.

17. The power supply system of claim 14, wherein the generator comprises a hybrid power source including a gas turbine and a fuel cell.

18. The power supply system of claim 16, wherein said fuel cell is selected from a group including solid oxide, solid state, molten carbonate, phosphoric acid and alkaline and proton electrolyte membrane fuel cells.

19. A method of propelling a vehicle, comprising the steps of:

converting a metal fuel to a metal oxide, wherein the step of converting the metal fuel releases electrons to produce electricity;

applying the electricity to an electric motor to drive a motor vehicle drive train; and

reconverting back at least a portion of said metal oxide to metal fuel by applying an electric charge from an on-board generator to the metal oxide.

20. The method of claim 19, wherein the metal fuel comprises one of zinc, aluminum, magnesium, lithium, calcium and iron.

21. The method of claim 19 further comprising the step of supplying a generator fuel to the on-board generator, wherein the generator converts the generator fuel to the electric charge.

22. An electrically-powered vehicle, comprising:

a motor for driving the vehicle; and

a metal-air converter powered by an on-board energy source for powering the motor,

wherein the vehicle can travel a distance of more than three hundred miles before requiring recharging of the battery from an off-board source.

23. The vehicle of claim 22, wherein the on-board energy source comprises a generator and a fuel supply.

24. The vehicle of claim 24, wherein the generator is selected from a group consisting of a fuel cell, a combustion engine, a gas turbine and combinations thereof.